Five Los Alamos innovations win R&D 100 Awards

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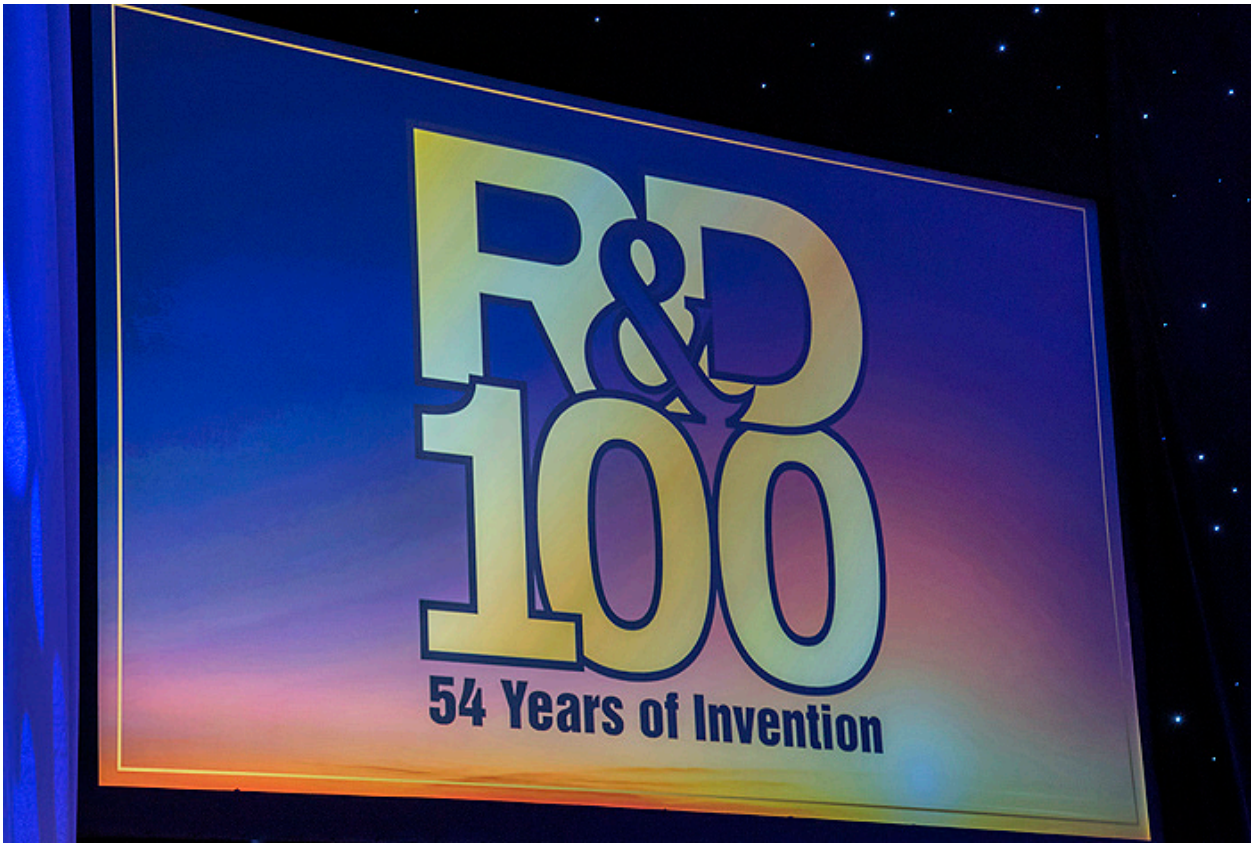

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‘Oscars of Innovation’ go to CCSI, Entropy Engine, Pathscan, PulMo and VERA

“These awards are representative of the multidisciplinary character of the work we do at Los Alamos, and result from partnerships with other national laboratories, private industry and universities,” said Director Charlie McMillan. “I applaud all of the R&D 100 award winners for their success and for showcasing the innovative science and technology that Los Alamos is known for.”

The winners are:

- Carbon Capture Simulation Initiative Toolset (CCSI),
- The Entropy Engine: Revolutionizing Computer Security—A Flood of Randomness for the Entropy Desert,

- PathScan: Security Analytics Software for Network Attack Detection,
- Pulmonary Lung Model (PuLMo): A Miniature, Tissue-Engineered Lung—Revolutionizing the Screening of New Drugs or Toxic Agents and
- Virtual Environment for Reactor Applications (VERA).

A sixth technology, Turning Windows and Building Facades into Energy-Producing Solar Panels: Engineered Quantum Dots for Luminescent Solar Concentrators, won the Green Technology Special Recognition Award.

“The Laboratory’s winners in the R&D 100 Award competition demonstrate the breadth of science that the Lab and its partners bring to bear for the national security mission,” said Carol Burns, deputy principal associate director of the Laboratory’s Science, Technology and Engineering directorate. “These innovative achievements include cybersecurity (Entropy Engine and PathScan), clean energy and the environment (Carbon Capture Simulation Initiative Toolset and Virtual Environment for Reactor Applications), and a miniature, tissue-engineered lung that contributes to health security (Pulmonary Lung Model). The Green Technology Award recognizes engineered quantum dots for solar concentrators that could be used to generate electrical energy. Several of these technologies, developed through partnerships, are already available to the public.”

About CCSI

Carbon Capture Simulation Initiative (CCSI) Toolset is a suite of computational tools and models that supports and accelerates the development, scale-up and commercialization of carbon dioxide capture technology to reduce domestic and global carbon dioxide emissions. The invention addresses key industrial challenges, including developing a baseline for the uncertainty in simulation results. It is the only suite of computational tools and models specifically tailored to help maximize learning during the scale-up process in order to reduce risk.

National Energy Technology Laboratory submitted the joint entry with Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Pacific Northwest National Laboratory, Princeton University, West Virginia University, University of Texas at Austin, Carnegie Mellon University, and Boston University. Joel Kress of Physics and Chemistry of Materials led the Los Alamos team, which included Jim Gattiker, Sham Bhat and Peter Marcy of Statistical Sciences; Brett Okhuysen of Systems Design and Analysis; David DeCroix of Intelligence and Emerging Threats Program Office and Susan Sprake of Richard P. Feynman Center for Innovation.

About Entropy Engine

Entropy Engine is a random number generator that addresses a key fundamental flaw in modern crypto systems—predictability. The invention strengthens the foundation of computer security by producing an inexhaustible supply of pure random numbers at speeds of 200 million bits per second. Entropy Engine uses the unique properties of quantum mechanics to generate true entropy (random numbers) in a way that makes it immune from all external influences.

Los Alamos submitted Entropy Engine as a joint entry with Whitewood Encryption Systems based on technology that Whitewood licensed from the Lab. Raymond Newell of Applied Modern Physics led the Los Alamos team of Glen Peterson of Applied Modern Physics and David Guenther of Space Electronics and Signal Processing, with collaborators Richard Moulds of Whitewood Encryption Systems, Jane E. Nordholt and Richard Hughes (retired Laboratory employees), Robert Van Rooyen of Summit Scientific Inc. and Alex Rosiewicz of A2E Partners, Inc.

About PathScan

PathScan provides security analytics for detecting computer network attacks. Traditional computer network security tools, which search for malware or network signatures, insufficiently protect from expensive data breaches. Traditional defense mechanisms —perimeter controls and end-point antivirus protection—cannot keep pace with these increasingly innovative and sophisticated adversaries. Rather than detecting something that “looks” like a cyberthreat, PathScan searches for anomalous communications behavior within the network. The invention performs a statistical analysis of abnormal behavior across a network and identifies the lateral, reconnaissance and data staging behaviors of attackers.

Ernst & Young submitted PathScan, a joint entry with the Lab, based on technology licensed from the Lab. Michael Fisk, the Lab’s chief information officer, led the Los Alamos team of Curtis Storlie of Statistical Sciences, Alexander D. Kent of the Intelligence and Emerging Threats Program Office and Melissa Turcotte of Advanced Research in Cyber Systems. Ernst & Young inventors include Joshua Neil, Curt Hash, Ben Uphoff, Alexander Brugh, Matt Morgan and Joseph Sexton.

About PuLMo

Pulmonary Lung Model (PuLMo) is a miniature, tissue-engineered lung developed to revolutionize the screening of new drugs or toxic agents. Current screening methods may not accurately predict response in humans. PuLMo has the potential to enable screening of new drugs more effectively by improving the reliability of pre-clinical testing and saving time, money and lives. PuLMo also could be used as a platform to study the flow dynamics of particles inside a lung for applications in drug delivery and particle/pathogen deposition studies.

Rashi S. Iyer of Information Systems and Modeling led the team of Pulak Nath of Applied Modern Physics; Jennifer Foster Harris, Ayesha Arefin, Yulin Shou, Kirill A. Balatsky and Jen-Huang Huang of Biosecurity and Public Health; Srinivas Iyer of Bioscience Division Office; Jan Henrik Sandin of Instrumentation and Controls; David Platts and John Avery William Neal of Applied Modern Physics; Timothy Charles Sanchez of Bioenergy and Biome Sciences and Miranda Huang Intrator of Richard Feynman Center for Innovation.

About VERA

Virtual Environment for Reactor Applications (VERA) provides coupled, high-fidelity software capabilities to examine light water reactors’ operational and safety performance-defining phenomena at levels of detail previously unattainable. The

multiphysics simulation toolkit covers the range of physics necessary to predict the performance of currently operating commercial nuclear power reactors. This capability enables users to study, mitigate and manage problems identified by the industry to a level of understanding that is not available through other toolsets. VERA supports options for both high performance computing and industry-sized computing clusters in a manner that is accessible and easily understood for most users.

Oak Ridge National Laboratory submitted VERA, a joint entry with Core Physics, Electric Power Research Institute, Idaho National Laboratory, Los Alamos National Laboratory, Sandia National Laboratories, North Carolina State University, University of Michigan and Westinghouse Electric Company. Christopher Stanek of Materials Science in Radiation and Dynamics Extremes led the Los Alamos work.

About Turning Windows and Building Facades into Energy-Producing Solar Panels: Engineered Quantum Dots for Luminescent Solar Concentrators

Turning Windows and Building Facades into Energy-Producing Solar Panels: Engineered Quantum Dots for Luminescent Solar Concentrators won the Green Technology Special Recognition Award. These revolutionary semitransparent windows contain highly emissive semiconductor nanocrystals (quantum dots) that collect sunlight for photovoltaics and provide a desired degree of shading. The material can turn windows and building facades into electrical generators of nonpolluting power. The nontoxic dots absorb the sunlight, re-emit it at a longer wavelength and waveguide it towards edge-installed photovoltaic cells to produce electricity. This technology can transform once-passive building facades into power-generation units, which can be particularly useful in densely populated areas.

Los Alamos submitted the joint entry with co-developer University of Milano-Bicocca. Victor I. Klimov of Physical Chemistry and Applied Spectroscopy led the team of Kirill Velizhanin of Physics and Chemistry of Materials, Hunter McDaniel (former Los Alamos postdoctoral researcher, currently with UbiQD LLC), Sergio Brovelli and Francesco Meinardi (University of Milano-Bicocca).

The R&D 100 Awards

The prestigious “Oscars of Invention” honor the latest and best innovations and identify the top technology products of the past year. The R&D 100 Awards span industry, academia and government-sponsored research organizations.

Since 1978 Los Alamos has won 137 of the prestigious R&D 100 Awards. The Laboratory’s discoveries, developments, advancements and inventions make the world a better and safer place, bolster national security and enhance national competitiveness.

See all of the 2016 R&D 100 Award winners.

The Green Technology Award recognizes innovations that help make our environment greener and our goals toward energy reduction closer. From an engineering and societal perspective, efficiency and environmental factors play an increasingly important role in the world today. See all of the special recognition winners.